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The contact between the Variscan and Cadomian blocks in the Svratka Dome (Bohemian Massif, Czech Republic)

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Abstract: The present author recently presented an alternative scenario for the tectonic development of the SE margin of the Bohemian Massif based on field studies of the Thaya Dome (Batík 1999). In the present paper, the tectonic evolution of the Svratka Dome is described and F. E. Suess's classic concept (1912) of Moldanubian nappe displacement over the Moravicum unit is discussed. The weaknesses of Suess's concept are shown, which pertain mainly to the character of the detachment planes and the amount of time assumed for all the supposed processes. An alternative tectonic scenario is that the Svratka Dome, consisting of Proterozoic granitoid and its overlying mantle, had already formed during the Cadomian orogeny. After Early Paleozoic erosion, its exposed nucleus was covered by Early Paleozoic basal siliciclastic sediments, which in turn are overlain by Devonian clastic and carbonate deposits and Early Carboniferous shales and greywackes. During the Variscan orogeny, which occurred from the Late Carboniferous to the Permian, a freshly consolidated and metamorphosed tectonic block was thrust along a steeply dipping plane over the Brunovistulicum. The Variscan phase continued by flat shears with eastern vergency. The last tectonic deformation events with western vergency affected the Svratka Dome during the Alpine orogeny.

Key words: Bohemian Massif, Moldanubicum, Moravicum, Brunovistulicum, Svratka Dome, Thaya Dome, Cadomian orogeny, Variscan orogeny, nappe structure

Introduction

The Moravicum, also called the Moravian unit, defined by F. E. Suess (1903), crops out along the SE margin of the Bohemian Massif in the tectonic window of the Svratka Dome and the larger Thaya Dome. The Moravicum, a tectonically specific unit, is of Precambrian age and is separated from the Moldanubicum, which was metamorphosed during the Variscan orogeny. Starting from the tectonic base and going upwards, Suess (1912) defined the Inner Phyllite and the Bíteš Gneiss units of the Moravicum. The Inner Phyllites were correlated with the Lukov Group in the Thaya Dome by Batík (1984) and with the Bílý Potok Group in the Svratka Dome by Jaroš and Mísař (1976). The Outer Phyllites can be correlated with the Vranov-Olešnice Group in the Thaya Dome (Dudek 1962), and with the Olešnice Group in the Svratka Dome (Jaroš and Mísař 1976). Suess (1912) considered these Outer Phyllites and the tectonically overlying mica-schists and mica-schist gneisses of the Mica-schist Zone as products of retrograde metamorphism of the Moldanubian rocks affected by the displacement of a Moldanubian nappe. According to his hypothesis, during the Variscan orogeny the Inner Phyllites and the Bíteš Gneiss were displaced over the autochthonous granitoid nucleus of the domes which was covered by Devonian sediments, and that this entire complex later became covered by the Moldanubian nappe.

Although some authors have expressed partial or fundamental objections to Suess's concept even during his lifetime (see detailed discussion in Dudek 1958), some geologists, mainly in Austria, still adhere to it. By contrast, recent investigation in the Czech Republic has resulted in the modification of some older tectonic concepts pertaining to the positions and contacts of the Moravicum and Moldanubicum (Jaroš and Mísař 1974, Mísař 1994, Štipská et al. 2000, Schulmann et al. 1991). Many questions persist, such as how to define the Moravicum, how and when the nappe displacement took place, which rocks are allochthonous, the location of the nappe's base and shear planes, the direction in which the nappes moved, and how to explain the difference in metamorphic grade between the Moravicum and Moldanubicum. These problems hamper the construction of geological maps along the Czech-Austrian border, and our efforts to link Czech- and Austrian-made maps (e.g. Roetzel et al. 1999).

The main questionable points in Suess's (1912) concept are the following: the detachment plane of the Moldanubian nappe, the nappe's direction of movement and distance moved, specification of the allochthon, and the time interval during which all the endogenous and exogenous processes are supposed to have occured. Each of these points is briefly discussed below.

1. The nappe detachment plane: According to Suess (1912) the Moldanubian displacement should have occurred at the level of the Mica-schist Zone, which he considered to be part of the Moldanubicum overlying the Bíteš orthogneiss, and formed by retrograde metamorphism of the displaced masses of the Moldanubian nappe.

The weakness of this concept is that a similar phenomenon has not been observed even in young orogenic zones where the nappes have been studied in detail. In most cases detachment planes cut several tectonostratigraphic horizons. In this case, however, the detachment plane, according Suess (1912), follows only the Mica-schist Zone. Moreover, his displacement mechanism should thus fully conform to the former Cadomian structure, which is also highly improbable from the tectonic viewpoint.

2. The direction and distance of nappe movement:

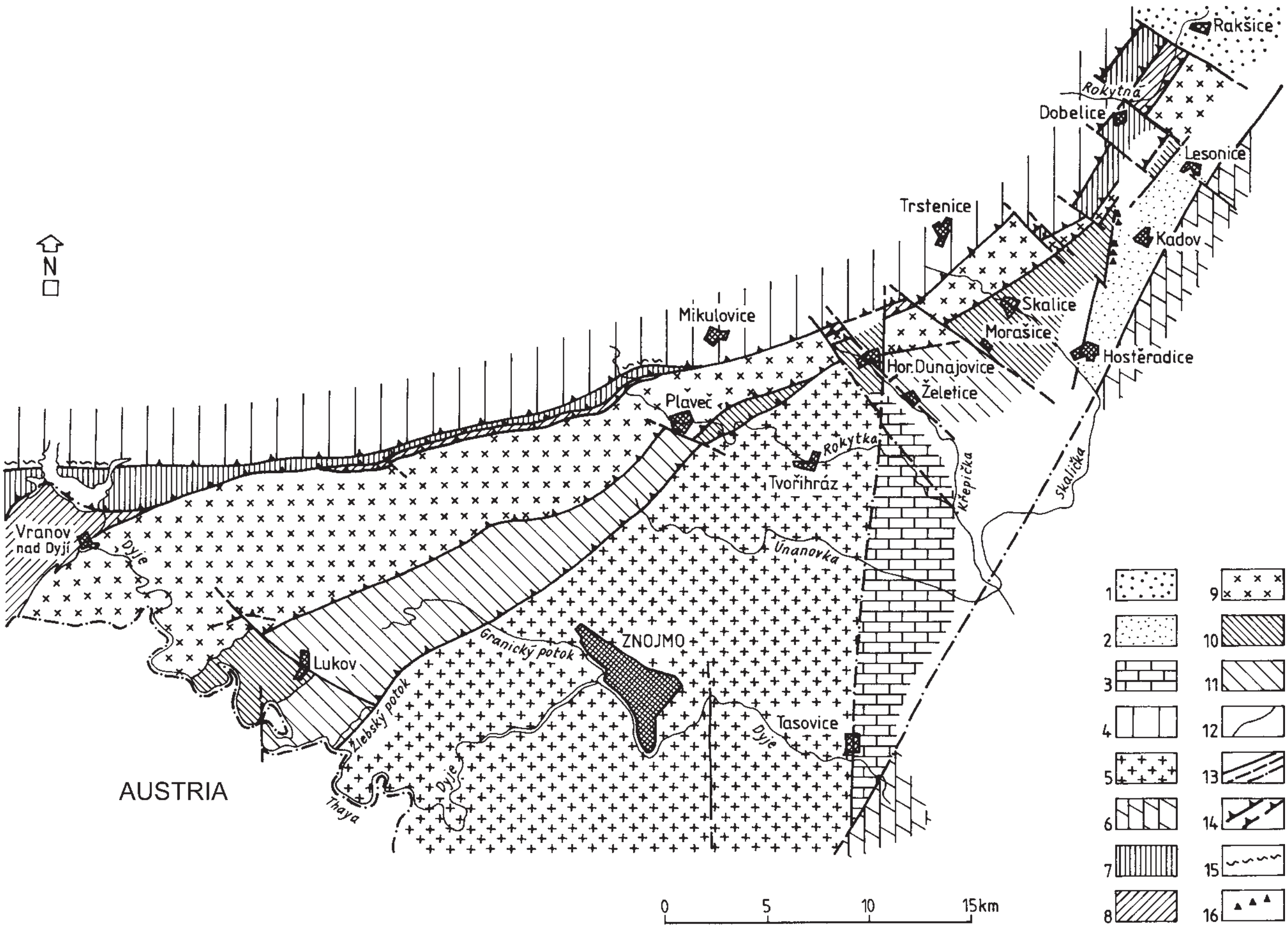

Figure 1. Detailed geological map of the Thaya Dome. Paleozoic 1 – Permo-Carboniferous clastic fill of the Boskovice Graben, 2 – Lower Carboniferous greywackes in the Boskovice Graben, 3 – limestone of Frasnian-Givetian age and basal siliciclastics of the Early Paleozoic, 4 – crystalline rocks of the Moldanubicum, 5 – granitoids of the Brunovistulicum, 6 – crystalline rocks at the towns of Miroslav and Krhovice. Moravicum: 7 – Šafov Group, 8 – Vranov Group, 9 – Lukov Group (upper part), 11 – Lukov Group (lower part), 12 – boundaries between rocks, 13 – faults, 14 – overthrusts and overfaults, 15 – mylonite zone, 16 – tectonic breccia.

According to Suess (1912) the Variscan Moldanubian nappe moved eastwards in the Thaya Dome, and covered the Moravicum and the Thaya Massif. Suess (1912) considered the Krhovice crystalline area and some of the crystalline rocks at Miroslav to be its relic. Thus the nappe front is supposed to have moved at least 40 km. Several authors, such as Mísař (1994), presumed that this main nappe movement was accompanied by partial Variscan movements in the Moravicum, with the detachment plane at the base of the Bíteš and Weitersfeld orthogneisses. The distances that such partial subnappes (or tectonic slices) have moved is difficult to estimate because their eastern margins have not been preserved.

In the Svratka Dome, however, the proposed displacement distances and even the movement of the masses is disputable. The Moravicum nappe in this Dome has been considered as the main nappe (Jaroš and Mísař 1974). These authors suggested that it was thrust along Dřínov plane and was displaced over the Svratka Granitoid and over relics of the Devonian basal siliciclastics and carbonates. The estimated distance of eastward movement should be 3–10 km. In the alternative case, if such movement is supposed to have been parallel with the identified northward strike of lineation (Hanžl et al. 2001), this Moravicum nappe could have covered the entire Svratka Dome and moved more than 50 km. The eastward displacement distance of the front of the Moldanubian nappe can be estimated as 8–23 km, provided that the mica-schists at the Klucanina locality represent relics of the eastern nappe margin, and that the nappe movement is measured from the Bíteš and Svojanov faults.

3. The problem of time: The amount of time necessary for the erosion of the masses of nappe rocks also casts doubt upon the existence of the Variscan nappe structure. Jaroš and Mísař (1974) estimated the thickness of the Moravicum nappe at 3–4 km. The thickness of the Moldanubian nappe has not been conclusively determined, though it could be several kilometres. The amount of time available for the displacement of all the nappes (3–50 km), including the necessary time gap between the movements of the Moravicum and Moldanubicum nappes, and also for the considerable erosion down to their autochthonous nuclei, could not have been more than 20 million years (stratigraphic interval Frasnian–Viséan). It is reasonable to relate this time period to known nappe displacements and erosional rates. It has been calculated that nappe displacement

proceeds at an annual rate of 1–14 mm in younger orogenic belts (Kukal 1990), though it is unclear whether such figures are applicable to older, Variscan orogens. The rate of erosion can be very different for soft and hard rock massifs. Nonetheless, we can apply many examples from younger orogenic belts, such as the Outer Western Carpathians. Their nappes have been displaced during a time interval of 20 million years (from the Middle Eocene up to Lower Miocene, see Stráník 2002), after which only negligible fluvial erosion occurred during the subsequent 17 million years.

4. Differences in the metamorphic intensity of the nappe complexes: Suess (1912) believed that the Moldabicum was deeply metamorphosed in the katazone, and that the Moravicum was less intensively metamorphosed in the epizone. From Suess's hypothesis (1912), and from the concepts of his followers (e.g., Jaroš and Mísař 1974), it could be deduced that the Moravicum nappe was displaced before the main Variscan tectonometamorphic phase. It would follow that its degree of metamorphism would be more intense, which is not the case.

In summary, the above-mentioned considerations demonstrate the need for reinterpretation of the tectonic processes in the zone under question. It can be objected that our presumptions are quite theoretical, though the lack of time for the displacement of all the nappes and their subsequent erosion seems rather concrete.

The Thaya Dome

Research on the Czech part of the Thaya Dome has brought recent results, much of which has been published. The following information is of interest here.

Whole rock samples of the Thaya Granitoid analysed by the Rb/Sr method have given ages around 551 ± 6 million years (Scharbert and Batík 1980). This age represents the formation, intrusion, and cooling of the magma during the Cadomian orogenic cycle.

The Krhovice Crystalline, which was taken for the relic of the eastern margin of the Moldanubian nappe by Suess (1912), was later studied by Dudek (1962). The latter called Seuss's interpretation into question and supposed that the unit occurs in an autochthonic position. This conclusion was supported by the subsequent discovery of a 200 m thick carbonate complex found to the West of the Diendorfer Fault (Batík and Skoček 1981), beneath Early Miocene sediments. Within this carbonate complex, in the Tasovice drill hole, Zukalová (in Čtyroký and Batík 1983) found a preserved foraminifera assemblage of Frasnian-Givetian age. In the Žerotice drill hole (in the same complex), Batík and Skoček (1981) identified the clay mineral montmorillonite. The presence of this unstable mineral and well preserved fossils indicate that this carbonate complex was probably not buried beneath the several kilometre thick Moldanubian nappe. This carbonate complex overlies basal Devonian deposits, and perhaps also older siliciclastics which in the Tasovice quarry cover the nonrecrystallized eastern margin of the Thaya Massif. Another small erosional relic of the siliciclastics is situated on the blastomylonitic zone near the western margin of the Thaya Massif (at the village of Únanov), which should evidently be a product of pre-Variscan deformation. Although this last occurrence might be of Tertiary age based on its heavy mineral associations (Otava 1997), we believe that the Únanov occurrence can be correlated with that of Tasovice.

To the SE of Lukov, in the lower part of the Lukov Group, many granitoids were found within 200 metres of the contact with the Thaya massif. These granitoids follow the foliation, were found, which belong to the Thaya Massive. Thus it can be deduced that the Lukov Group represents the mantle of the Thaya Massif, although the two are now tectonically detached from each other. In the Thaya Valley, however, the detachment distance is far smaller than in the NE closure of the Thaya Dome. Upwards in the Moravicum rock complex, west of Lukov, the Bíteš Orthogneiss is also tectonically detached from its basement. However, granitoid apophyses of the Bíteš Orthogneiss in the topmost part of the Lukov Group indicate that even here the detachment cannot be complete (Fig. 3).

The Variscan structure of the Thaya Dome was completed by flat shears with eastern vergency. They were accompanied by a slip several tens of metres long. This is visible on the eastern part of the Thaya Massif in the Tešetice quarry (Čtyroký and Batík 1983) and was also found in the Žerotice drill hole (Batík and Skoček 1981). It is supposed that these shear movements also influenced the tilting of the basal siliciclastics in the Tasovice quarry and Early Carboniferous sediments near the Hostěradice locality.

The Thaya Dome – a short retrospective

Three main geological units are defined at the SE margin of the Bohemian Massif: the Moldanubicum, the Moravicum (both of which were defined by F. E. Suess, 1903), and the Brunovistulicum (defined by Dudek 1980). More recently, the view has been expressed that all three units have had the same or very similar tectonometamorphic development up to the end of the Neoproterozoic (Batík 1999, 2003). The area started to become differentiated as late as during the Variscan orogeny. That part, defined as the Moldanubicum by Suess (1903), was completely reworked by metamorphic processes. By contrast, notable metamorphic changes are not observed in the Brunovistulicum. The Moravicum tectonostratigraphic unit is quite different from the surrounding units, and it appeared only after the termination of the Variscan tectogenesis. It should therefore be emphasized that the Moravicum as an independent unit began to exist only since the Variscan orogeny. The Moravicum is separated from the neighbouring units mainly by steeply sloping overthrusts (marginal overthrust after Zapletal, 1926). Such overthrusts are associated with mylonites in some places, and also by smaller faults and

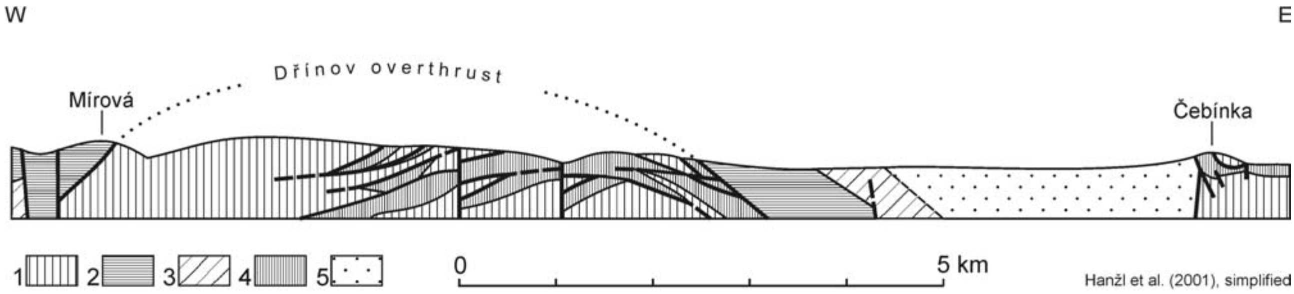

Figure 2. Geological cross section. Proterozoic: 1 – granitoids of the Svratka Dome and Brno Massif, and their mantle. Paleozoic, Moravicum nappe: 2 – Bílý Potok Group, 3 – Bíteš Orthogneiss. Devonian: 4 – Carbonates and siliciclastics – Tišnov development and development at the eastern margin of the Boskovice Graben, 5 – Boskovice Graben.

deep-seated discontinuities at the western part of the Thaya Dome. Considering its metamorphic grade, the Moravicum appears to be a transitional unit in which older Cadomian metamorphism has been preserved. Variscan metamorphism only slightly affected this unit; though deformational changes might be enormous in some places, they were not so extensive as to be able to rework the Cadomian anticlinal structure. The Moravicum complex thus represents an original part and/or an equivalent of the mantle of the Proterozoic granitoids. Variscan tectogenesis, during its ultimate phases, caused its detachment from this primary place, even though at a small distance. This movement was accompanied by internal slicing, a process that causes many tectonic reductions in tectonically delineated blocks and in multiple vertical levels of rock successions. The most informative reductions of this type occur in the NE part of the Thaya Dome (Fig. 1). Although the Moravicum sequence is roughly complete at the level of Thaya River bottom, it is tectonically and selectively reduced towards the northeast. For example, behind the late Variscan transversal fault at Lukov, the entire upper part of the Lukov Group is missing. In the district between the villages of Plavče and Horní Dunajovice, this upper part reappears, though reduced in thickness and with its entire lower part missing. Between the villages of Želetice and Morašice only the lower part of the Lukov Group is present, whereas between Trstenice and Hostěradice only the upper parts of the Lukov Group are present. South of the village of Rakšice, at the last occurrence of the Moravicum, only slices of the Bíteš Orthogneiss and the rocks belonging to the Vranov and Šafov groups are present. As shown in Fig. 1, large nappe planes beneath the Weitersfeld Orthogneiss (correlated with the Dřínov detachment plane in the Svratka Dome, according to Mísař 1994) and the Bíteš Orthogneiss are supposed to exist here according to Štipská et al. (2000). However, the latest geological mapping activities have not found them (Batík 2004).

In conclusion, Suess's (1912) concept of the nappe structure of the Thaya Dome, would appear to be disproven by the above-mentioned observations. Moreover, using Suess's (1912) conviction about the analogous structures of the Thaya and Svratka domes, we venture to apply our observations from the Thaya Dome to the Svratka Dome.

The Svratka Dome

In 2001 the Czech Geological Survey presented geological map sheet 24-321 Tišnov, which is situated in the very centre of the Svratka Dome. This map and the following discussion show that Suess's (1912) nappe concept as modified by Zapletal (1926), Jaroš and Mísař (1974), and Hanžl et al. (2000, 2001) is still applied to the tectonic development of the Svratka Dome. However, it does not satisfactorily account for all the phenomena; and it is for this reason that the present author has developed an alternative scenario. The cross section attached to the above mentioned map illustrates the crustal structure to a depth of 700 m. It crosses the Svratka Dome from the west, across the western flank of the Moravicum nappe and the central part of the Svratka Dome with preserved Závist Devonian deposits, and continues to the eastern flank of the Moravicum nappe where it crosses the Boskovice Graben and reaches the Brno Granitoid near the village of Čebínka. The Moravicum nappe is shown as a rigid compact plate, whereas the autochthon appears as a body with a slice-like structure. This cross section depicts the classic concept of the structure of the SE margin of the Bohemian Massif, and also demonstrates its weak points. It does not account for the existence of the eastern flank of the Moldanubian nappe. The Moravicum nappe is presented there as a main alochthonous component which did not cross the zone of the Boskovice Graben, in contrast to the Thaya Dome. This cross section also does not clarify the origin of the post-Devonian slices in the autochthon.

Two simplified scenarios are presented here in the interest of clearly demonstrating an alternative interpretation of the structure of the Svratka Dome. The first one (Fig. 4) represents the traditional model in accordance with Suess (1912), Zapletal (1926, 1932), Jaroš and Mísař (1974), and Hanžl et al. (2001). The second (Fig. 5) shows an alternative interpretation that applies the results of recent investigations on the Thaya Dome. The two scenarios are constructed along the same cross-section as presented by Hanžl et al. (2001, Fig. 2).

Traditional scenario (Figure 4)

4a. Granitoids were emplacement into the mantle. According to recent radiometric data, the Svratka and Brno granitoids are of the Proterozoic age. Previously, various views on the age of these granitoids were presented.

4b. Early Paleozoic erosion removed almost the entire mantle, with only relics of its roots having been preserved as the Deblín Series (according to Jaroš and Mísař 1976, and Hanžl et al. 2001). Early Devonian terrestrial siliciclastic sediments were deposited on the peneplenized surface, and subsequently overlain by marine clastics and carbonates of Frasnian-Givetian age.

4c. During the Famennian-Tournaisian interval, eastward (northward?) displacement of the Moravicum nappe occurred over the basement, as shown in Fig. 4b. The term Tišnov Brunides was introduced for this basement by Jaroš and Mísař (1976). The autochthon was cleaved and sliced by this movement. To the west of the Svratka tectonic window, Variscan granitoids were emplaced and the mantle became migmatized. The eastern margin of the Moldanubicum was displaced as a nappe over the Moravicum parautochthon, at least up to the area of the future Boskovice Graben.

4d. The erosion continued. A marine transgression advanced from the east over the Cadomian block and Viséan greywackes, where shales were deposited. The initial subsidence occurred in the area of the future Boskovice Graben.

4e. The Boskovice Graben subsided and became filled with Late Carboniferous and Permian sediments. Post-Permian compression with western vergency at the Čebínka locality caused the flat thrusting of the granitoid over the Devonian deposits.

Alternative scenario (Figure 5)

The following alternative scenario is suggested by the present author.

5a. Granitoids were emplaced into a polymetamorphosed mantle during the Proterozoic (Batík and Fediuková 1992).

5b. Early Paleozoic erosion removed almost all of the granitoid mantle from the upper parts of the Svratka Dome. The deposition of basal siliciclastics was followed by clastic and carbonate sedimentation during the Givetian–Frasnian interval. After a possible hiatus encompassing the Famennian–Tournaisian interval, Viséan marine greywackes and shales were deposited.

5c. To the west of the Svratka Dome, during the Late Carboniferous and Permian, the main phase of the Variscan rebuilding of the Proterozoic complex occurred together with the consolidation of the Moldanubicum. The Moldanubicum was steeply thrust over the Proterozoic Svratka Dome from the west, i.e. over the Svratka granitoid core and its metamorphic mantle (correlated with the Moravicum). In contrast to the Thaya Dome, where only the margins were recrystallized, the Svratka granitoid nucleus became completely recrystallized. The area of the future Boskovice Graben subsided simultaneously with the Moldanubian overthrusting.

5d. Intense erosion had occurred by the end of the Carboniferous and during the Permian. The Variscan restructuring of the Moldanubicum culminated in flat near-surface shears with eastern vergency and slicing. The subsidence and filling of the Boskovice Graben continued.

Figure 3. Intrusion of the Bíteš Orthogneiss into the uppermost part of the Lukov Group. Valley south of Čížov settlement (photo P. Čtyroký).

5e. The tectonic development of the Svratka Dome was terminated by shorter, flat, and steep shears with western vergency (locality Čebínka). It is not likely that this phenomenon represents an isolated case in this area, and thus similar effects are presumed to exist to the east of the Boskovice Graben. Such movements could be correlated with post-Turonian tectonic events in the Carpathian region (Rez and Melichar 2002) though this idea has not yet been observationally confirmed.

Discussion

In the traditional scenario described above, the Svratka Proterozoic granitoid, its mantle relics, and the Devonian sediments represent an autochthonous core upon which the Moravicum and Moldanubian nappes were overthrust during the Variscan orogeny. The exposed part of the eastern flank of the Moravicum nappe is formed by the Bíteš Orthogneiss and mica-schists with crystalline limestones of the Bílý Potok Group, south of the town of Tišnov, as illustrated on the map of Hanžl et al. (2001). The eastern part of the Moldanubian nappe is represented by crystalline rocks to the east of Tišnov. According to Malý (1993) this Moldanubian nappe forms the Permocarboniferous basement of the Boskovice Graben. The displacement of both nappes occurred during the Famennian-Tournaisian time interval.

The second scenario, suggested by the present author, infers the Cadomian age of the deformation and the Early Paleozoic erosion of the Svratka Dome. This Dome is comprised of a granitoid core and its mantle, the latter of which

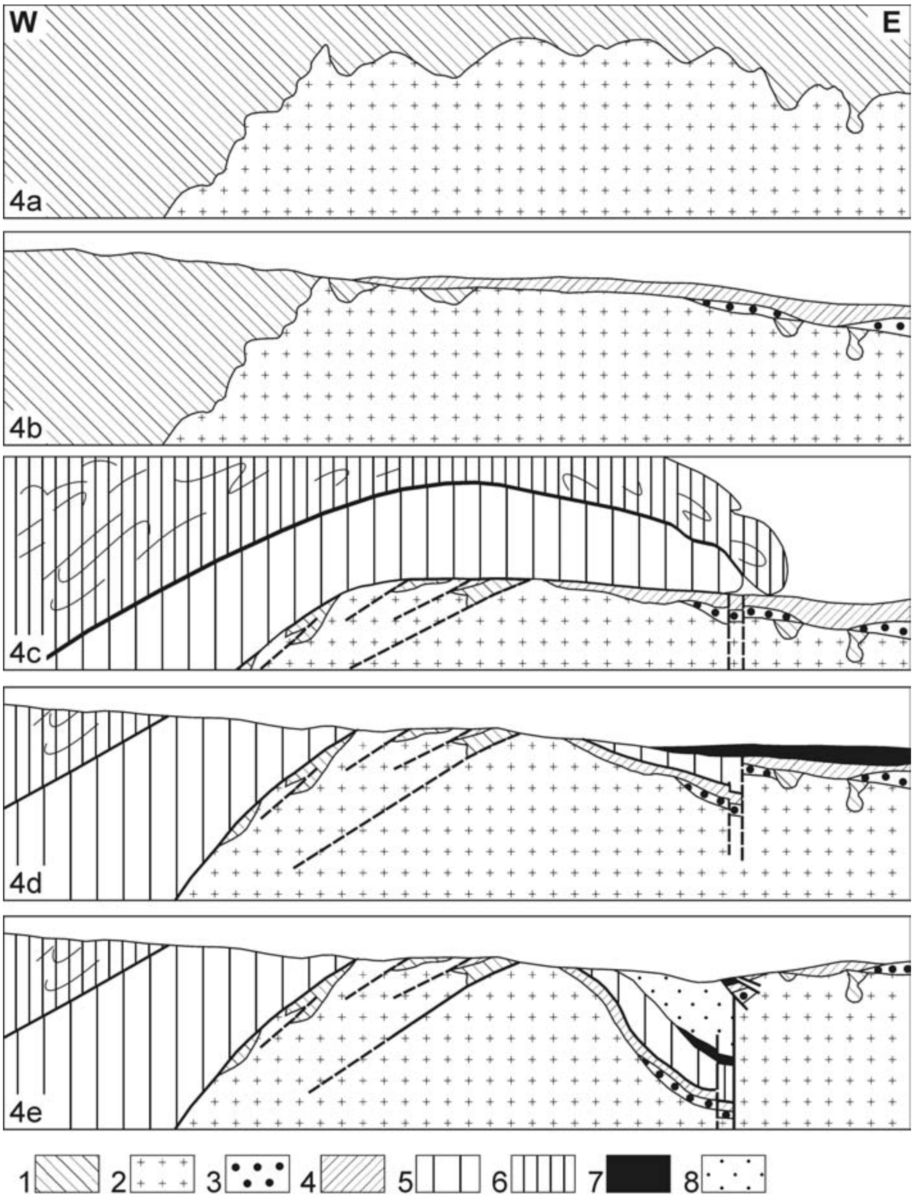

Figure 4. Traditional scenario of tectonic development. Autochthon: 1 – crystalline mantle, 2 – granitoid intrusion, Devonian, 3 – basal siliciclastics, 4 – clastics and carbonates. Allochthon: 5 – Moravicum nappe, 6 – Moldanubian nappe. Orogenic and post-orogenic sediments: 7 – Early Carboniferous in Culm development, 8 – Permian of the Boskovice Graben.

forms the Moravicum. The peneplainized surface became covered by Early Paleozoic siliciclastics, subsequently overlain by clastic and carbonate sediments of Frasnian-Givetian age, and by greywackes with shales of Viséan age. During the Late Carboniferous up to the Late Permian, in the course of the ultimate phase of the Variscan tectogenesis, the Moldanubian block was steeply thrust over the western margin of the Svratka Dome. Dynamic deformation continued with near-surface flat shears that affected the slice-like structure of the Svratka Dome. Such deformation was associated with the slight recrystallization and deformation of the basal siliciclastics and Devonian sediments (Plášil 1977). This tectonic development was terminated by shears with western vergency, as represented by the flat overthrusting of the Brno granitoid over the Devonian at the Čebínka locality. Some local tectonic features might also be the results of this tectonic phase, such as the tilting of basal siliciclastics at the Babí Quarry, the scraping of Eifelian-Givetian limestones and basal clastics into the Brno Granitoid near the town of Adamov, and the thrusting of the Moravicum over the Devonian limestone belt near the village of Heroltice. The main phase of subsidence of the Boskovice Graben can possibly be chronologically correlated with the "marginal overthrusting" (after Zapletal 1926) of the less active and cooled Moldanubian block.

Conclusion

This paper counters Suess's (1912) classic model of the structure of the Bohemian Massif's SE margin with an alternative conception based on the investigation of the Thaya Dome. It is supposed that the Cadomian orogeny affected the fundamental structure of the Svratka Dome. The Moravicum developed as the mantle of the Brunovistulian granitoid by the end of the Proterozoic, and became a distinct tectonometamorphic unit only after the Variscan orogeny. After substantial Early Paleozoic erosion, the surface of the western part of the Brunovistulicum became covered first by Early Devonian basal siliciclastics, and subsequently by Devonian carbonates and Early Carboniferous greywackes. With the Variscan recrystallization of the Moldanubian block and the subsequent steep overthrusting of the Moldanubicum over the Svratka Dome, only slight recrystallization occurred in the Dome's core.

By contrast, the Svratka Dome was substantially affected by dynamic metamorphism. The Variscan orogenic phase continued, with flat shears with eastern vergency and the creation of the Boskovice Graben. Post-Permian (up to the Badenian) shears with western vergency terminated the tectonic development in this area. These shear zones might correlate with the Alpian-Carpathian orogeny, though evidence to support this inference is still lacking. The clear manifestation of such shears is the only difference between the Svratka and Thaya domes.

A comparison of figures 4e and 5e distinctly shows the main differences between these two scenarios. In the classic conception, Early Devonian basal siliciclastics, carbonates of Middle and Late Devonian ages, the Moravicum nappe, the Moldanubicum nappe, and the Early Carboniferous greywackes are supposed to appear beneath the Permo-Carboniferous Boskovice Graben fill and above the Brunovistulian granitoids. In the alternative scenario presented here, the Brunovistulian granitoids are supposed to be overlain by their mantle (the Moravicum, in situ), followed by the Early Paleozoic basal siliciclastics, the Middle and Upper Devonian carbonates, all of which are topped by the Early Carboniferous greywackes.

There are aspects of the structure and development of the Svratka Dome that cannot be accounted for in the present author's alternative model. It has not yet been conclusively demonstrated that the Devonian sediments cover not only the Brunovistulian granitoids but also its mantle (i.e. the Moravicum), or that they are hidden below the eastern flank of the Moravicum nappe. Nonetheless, it is the opinion of the present author that the results of his investigation of the Thaya Dome are also applicable to the Svratka Dome.

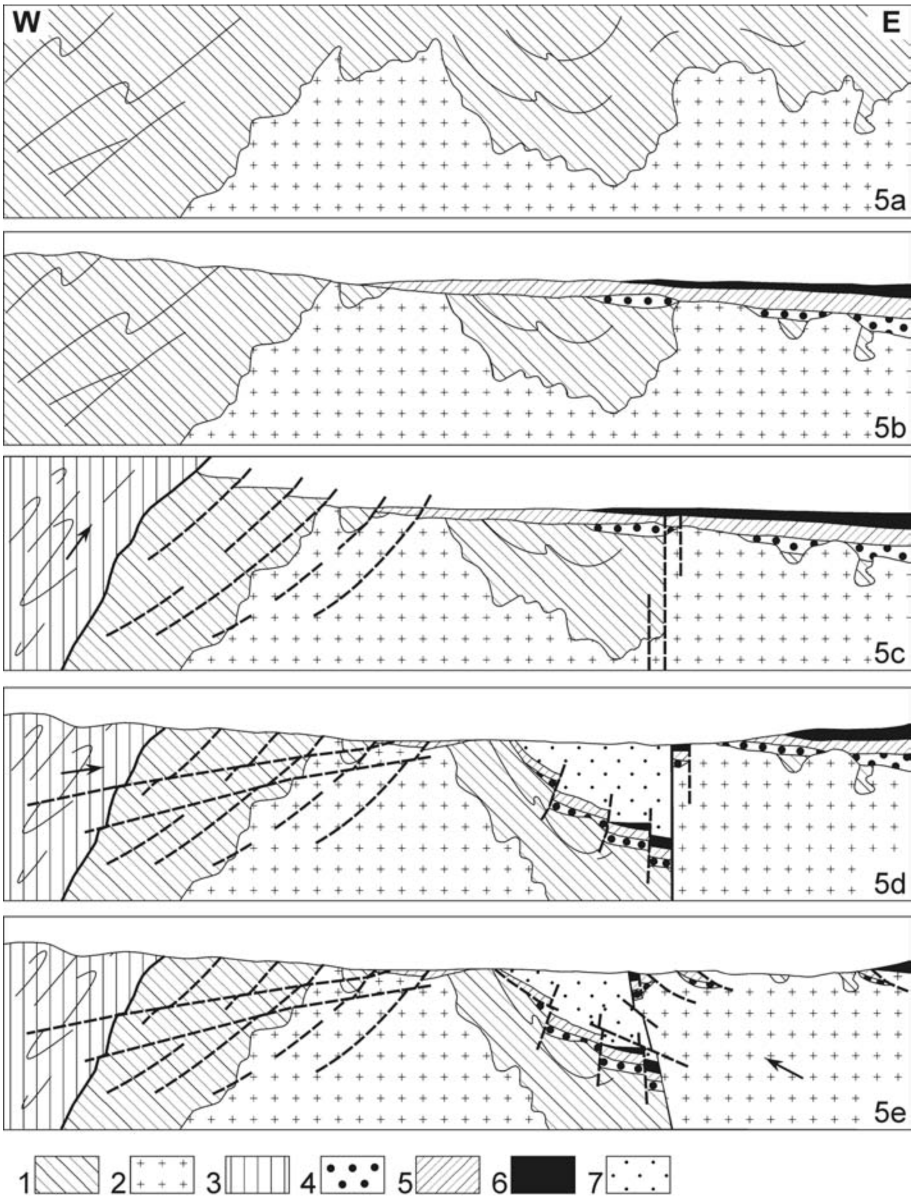

Figure 5. Alternative scenario of tectonic development. Proterozoic: 1 – crystalline mantle, 2 – granitoid intrusion. Paleozoic: 3 – Variscan consolidation of crystalline mantle – Moldanubicum, 4 – Devonian, basal siliciclastics, 5 – clastics and carbonates, 6 – Early Carboniferous, greywackes and shales, 7 – Permocarboniferous, clastic fill of the Boskovice Graben.

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References

Batík P. (1984): Geologická stavba moravika mezi bítešskou rulou a dyjským masívem. Věst. Ústř. Úst. geol. 59, 6, 321–330. (in Czech)

Batík P. (1999): Moravikum dyjské klenby – kadomské předpolí variského orogénu. Věst. Čes. geol. Úst. 74, 3, 363–369. (in Czech)

Batík P. (2003): Je Suessova představa rozsáhlého moldanubického příkrovu jediným možným řešením geologické stavby východního okraje Českého masivu? Zpr. geol. Výzk. v Roce 2002 , 11–16. (in Czech)

Batík P. (2004): Tektonické uspořádání moravika severní části dyjské klenby po závěrečné fázi variské orogeneze. Zpr. geol. Výzk. v Roce 2003, 9–12. (in Czech)

Batík P., Fediuková E. (1992): Garnet chemistry of metamorphic development and deformations of the Moravicum in the Dyje dome. Věst. Čes. geol. Úst. 67, 1, 2–24.

Batík P., Skoček V. (1981): Litologický vývoj paleozoika na východním okraji dyjského masivu. Věst. Ústř. Úst. geol. 56, 6, 337–343. (in Czech)

Čtyroký P., Batík P. (1983): Vysvětlivky k základní geologické mapě ČSSR 1 : 25 000, 34-113 Znojmo. Ústř. úst. geol., Praha. (in Czech)

Dudek A. (1958): Přehled geologických a petrografických výzkumů českomoravské vrchoviny a dolnorakouské Lesní čtvrti. Academia, Praha.

Dudek A. (1962): Beitrag zum Problem der moldanubischen Überschiebung (Miblitzer Horst). Sbor. geol. Věd, Geol. 1, 7–20. (in Czech)

Dudek A. (1980): The cristalline basement block of the Outer Carpathians in Moravia-Brunovistulicum. Rozpr. Čs. Akad. Věd, Ř. mat. přír. Věd 90, 8, 1–85.

Hanžl P. et al. (2000): Základní geologická mapa 1 : 25 000, 24-322 Blansko. Archives Czech Geol. Surv., Praha. (in Czech)

Hanžl P. et al. (2001): Základní geologická mapa 1 : 25 000 24-321 Tišnov. Archives of the Czech Geol. Surv., Praha. (in Czech)

Jaroš J., Mísař Z. (1974): Deckenbau der Svratka-Kuppel und seine Bedeutung für das geodynamische Modell der Böhmischen Masse. Sbor. geol. Věd, Geol. 26, 69–82.

Jaroš J., Mísař Z. (1976): Nomenclature of the tectonic and lithostratigraphic units in the Moravian Svratka Dome (Czechoslovakia). Věst. Ústř. Úst. geol. 51, 113–122.

Kukal Z. (1990): The rate of geological processes. Earth-Sci. Rev. 28, 1–284.

Malý L. (1993): Formování sedimentační pánve permokarbonu boskovické brázdy a vývoj svrchnostefanské sedimentace v rosicko-oslavanské pánvi. Sborník příspěvků k 90. výročí narození prof. dr. Karla Zapletala. Geologie Moravy a Slezska. Moravské zemské muzeum a sekce geol. věd Přír. Fak. Masaryk Univ., 87–99. Brno. (in Czech)

Mísař Z. (1994): Terranes of eastern Bohemian Massif: Tectonostratigraphic and lithological units of the Moravicum and Moldanubicum. J. Czech Geol. Soc. 39, 1, 71–73.

Otava J. (1997): Křemenné arkózové pískovce mezi Únanovem a Tvořihrází: Devonská klastiky nebo relikty terciérní durikrusty? Geol. Výzk. Mor. Slez. v Roce 1996, 37–38, Brno. (in Czech)

Plášil M. (1977): Deformační analýza křemenných valounů devonských konglomerátů v jižní části svratecké klenby. Report, Archives of the Charles Univ., Praha. (in Czech)

Rez J., Melichar R. (2002): Tektonika výskytu devonu u Adamova. Geol. výzk. Mor. Slez. v Roce 2001, 9, 57–61. (in Czech)

Roetzel R. et al. (1999): Geologische Karte der Republik Österreich 1 : 50 000, 9 Retz. GBA. Wien.

Scharbert Z., Batík P. (1980): The age of the Thaya (Dyje) pluton. Verh. Geol. Bundesanst. 3, 325–333.

Schulmann K., Ledru P., Autran A., Melka R., Lardeaux J. M., Urban M., Lobkowicz M. (1991): Evolution of nappes in the eastern margin of the Bohemian Massif: a kinematic interpretation. Geol. Rdsch. 81, 1, 73–92.

Štipská P., Schulmann K., Höck V. (2000): Complex metamorphic zonation of the Thaya Dome: result of buckling and gravitational collapse of an imbricated nappe sequence. Forced Faults and Fractures, Geol. Soc. Spec. Publ. 169, 197–211.

Stráník Z. (2002): Terciér flyšového pásma Západních Karpat České republiky. In: Chlupáč I. et al. Geologická minulost České republiky. Academia, Praha, 336–344. (in Czech)

Suess F. E. (1903): Bau und Bild der Bömischen Masse. In: Diener C. et al. Bau und Bild Österreichs. Tempsky-Freytag, Wien, 1–322.

Suess F. E. (1912): Die moravischen Fenster und ihre Beziehung zum Grundgebirge des Hohen Gesenke. Denkschr. K. Akad. Wiss., math. naturwiss. Cl. 88, 1–91.

Zapletal K. (1926): Geologie středu Svratecké klenby. Sbor. St. geol. Úst. 5, 509–560. (in Czech)

Zapletal K. (1932): Geologie a petrografie země Moravskoslezské. Brno. (in Czech)